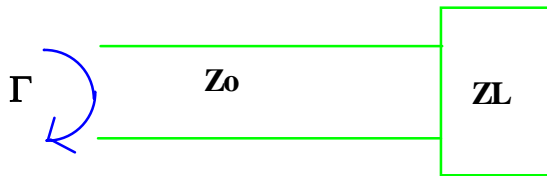




Smith Chart Tutorial Part 2 - Transmission Line Matching

Solution of matching problems on a Smith Chart



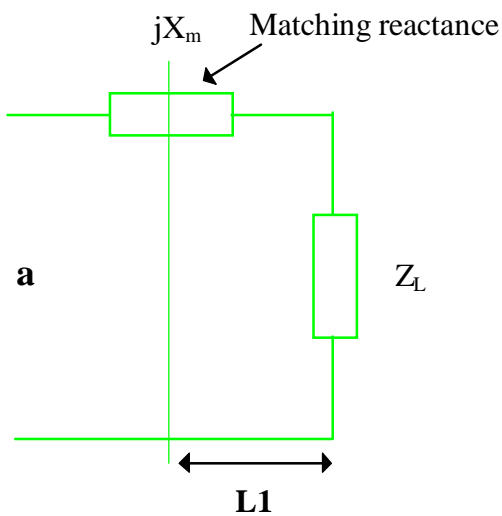
$$\Gamma = \frac{Z_L - Z_o}{Z_L + Z_o}$$

If $Z_L = Z_o$ then all the power is transmitted to the load.

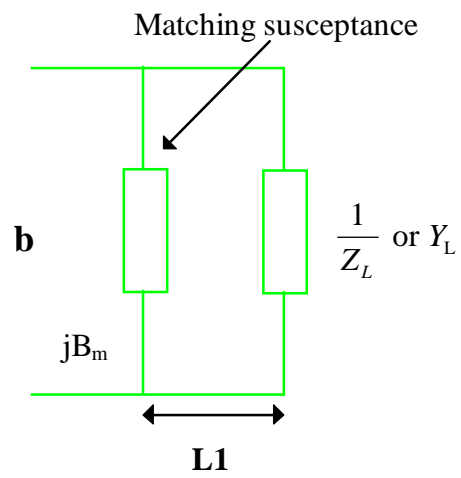
If $Z_L \neq Z_o$ then some power will be reflected ie mismatched.

Matching

add element to T.L to make $\Gamma \rightarrow 0$.



Series Matching



Shunt, Stub, parallel matching



(a) Series Matching

(1) Plot $Z_L = Z_L/Z_0$ on Smith Chart.

(2) Draw VSWR circle through Z_L .

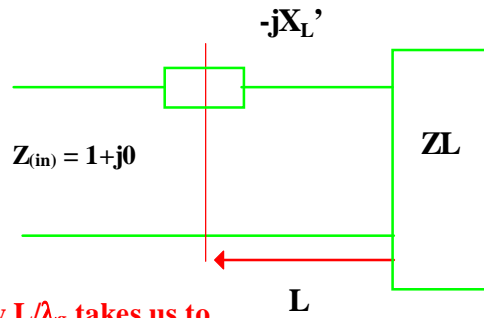
(3) Transform Z_L to Z_L' by moving **BACKWARDS** from Z_L to the $r=1$ circle.

(4) Here $Z_L' = 1 + jX_L'$ \therefore read X_L' from Smith Chart.

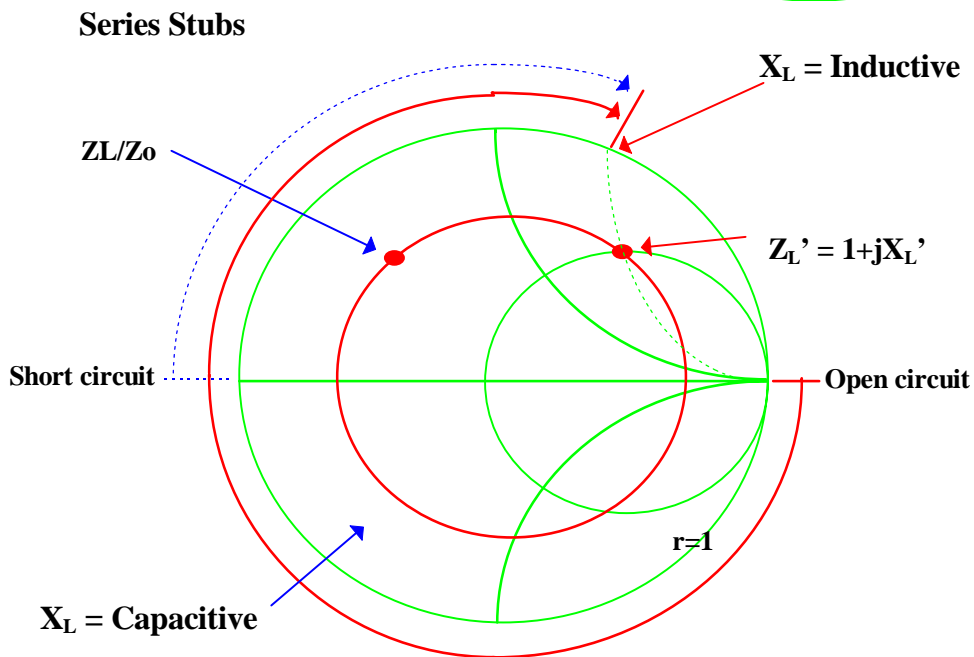
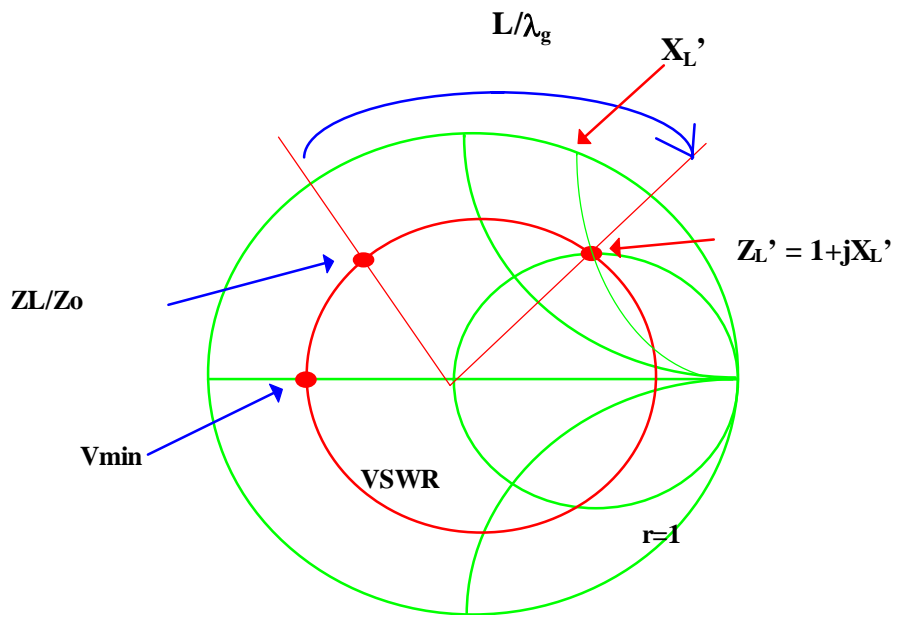
(5) Add matching element $X_m = -X_L'$ at this point. The total impedance =

$$Z_L = 1 + jX_L' + jX_m .$$

$$= 1 + jX_L' - jX_L' = 1 + j0 \text{ (centre of Smith Chart - matched).}$$



BACKWARDS by L/λ_g takes us to Z_{in} .





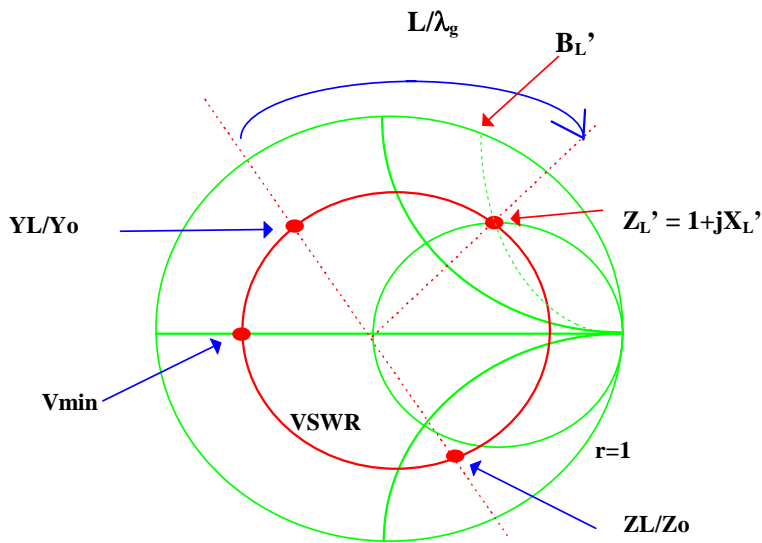
(b) Shunt Matching

(1) Plot Z_L .

(2) Transform to Y_L (diametrically opposite point).

(3) Proceed as for the series matching case, but using the Smith Chart as an admittance diagram. i.e. $\Rightarrow g = 1$ circle, read off B_L' , add $B_m = -B_L'$ at distance L .

NOTE +ve Susceptance is a shunt capacitance and -ve is a shunt inductance.



Shunt Stubs

